Use of Subordinated Debt in the Supervisory & Monitoring Process and To Enhance Market Discipline

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Abstract

Previous studies have found that sub-debt markets do differentiate between banks with different risk profiles. However, they evaluated the potential usefulness of sub-debt spreads in an environment that most likely is very different from the one that will characterize a fully implemented sub-debt program. With a sub-debt program, the market will become deeper, issuance will be more frequent, debt will be viewed as a more viable means to raise capital, bond dealers will be less reluctant to publicly disclose more details on debt transactions, and generally, the market will be more closely followed. We evaluate the risk-spread relationship, accounting for the enhanced market transparency surrounding new debt issues in this study. We account for differences in maturity structure of debt across banks and for potential sample selection bias; both which have often been overlooked in previous studies. Our empirical results indicate that banks tend to avoid issuing new publicly traded sub-debt during a period of financial deterioration. In addition, we find a tighter risk-spread relationship during the period of new issuance due, we posit, to greater liquidity and transparency, suggesting that the degree of market discipline would likely be enhanced by requiring banks to periodically issue sub-debt. Our results also provide some important implications related to the use of sub-debt signals in bank supervision. It is currently difficult to analyze and compare sub-debt spreads across banking institutions because of difficulties involved in finding homogeneous issues in the market. We calculate some specific premiums that could be adjusted to the observed sub-debt spreads for the various remaining maturities to arrive at more meaningful and more comparable spreads across banking institutions.

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1. Introduction and Objective

There have recently been a number of proposals to increase the role of subordinated debt (sub-debt) in the bank capital requirements in an attempt to increase the role of market discipline on large and complex banking organizations (LCBOs). Similarly, there has also been a growing consensus that bank risk could be more effectively managed if market information and market discipline were more fully incorporated into the supervisory and monitoring process. These two issues are inter-related. More effective market discipline, potentially resulting from increasing use of sub-debt by banking institutions, would likely enhance the quality of market signals. These signals could be used by bank supervisors for on-site as well as off-site monitoring processes to identify problem institutions – thus, would result in more effective use of market information in the supervisory process.

It has become widely accepted that increased reliance on market forces by supervisors is necessary given the increasing level of complexity in the banking industry, particularly at the LCBOs [Greenspan (2000), Ferguson (1999), Meyer (1999), Moskow (1998), Bank for International Settlement (1999)]. Previous research found that sub-debt spreads do indeed reflect an issuing bank's financial condition [see Flannery and Sorescu (1996), DeYoung, Flannery, Lang and Sorescu (1998), Jagtiani, Kaufman and Lemieux (2000), Jagtiani and Lemieux (2001), Allen, Jagtiani and Moser (2000), and Morgan and Stiroh (2000a and 2000b)]. In addition, Evanoff and Wall (2001 and 2002) suggest that sub-debt spreads may be more informative for identifying problem banks than are the current regulatory measures used to trigger Prompt Corrective Action (PCA) in the U.S.

Yet, there are still concerns about the potential for using the signal extracted from sub-debt yields (particularly by itself) to monitor or predict the viability of banking institutions [Bliss (2001) and Birchler and Hancock (2004) and Covitz and Harrison (2004)]. This partially results from concerns about market depth, trading frequency, and infrequent issuances.

The new Basel Capital Accord (Basel II), to be implemented by year-end 2006, has proposed that market discipline be one of the three pillars supporting safety and soundness of the banking system—thus, raising the potential for more extensively using the sub-debt market for supervisory and disciplining purposes. The Bank for International Settlement (BIS) recognized that following Basel I, LCBOs have been able to effectively arbitrage the existing risk-based capital requirements, and that any attempts to close existing loopholes (under Basel II) will likely result in additional regulatory avoidance behavior. It is thought that increased reliance on market forces could decrease the effectiveness of this avoidance behavior since banks would be required to satisfy the market in addition to the rigid capital regulation. Sub-debt (and other market instruments) could potentially play a larger role in future bank capital regulation by augmenting explicit capital requirements. As a result, market signals would become more meaningful for bank monitoring and could more effectively be used to augment supervisory oversight.

The paper proceeds as follows. In the next section we discuss the arguments for increasing reliance on market discipline in banking and review the literature on the relationship between market signals and the condition of the firm. Section 3 more closely relates the use of market information to the bank supervision process. In section 4 we introduce our empirical method of evaluating the extent to which sub-debt yields reflect bank risks. Our data and the empirical results generated are presented in section 5. The

last section summarizes and evaluates the policy implications.

2. The Potential Role of a Mandatory Subordinated Debt Program

The potential for more effectively incorporating market information into the supervisory process has gained credence in recent years. According to Federal Reserve Governor Laurence H. Meyer (1998 and 2000):

> *"Although supervisory reviews of risk management systems will become even more important in the years ahead, they are not enough by themselves. As large banking institutions become increasingly complex – and fund themselves more from non-insured sources – market discipline and its prerequisite, public disclosure, must play a greater role." (2000)*

> *"I do believe there is considerable promise in a subordinated debt requirement…. Sub-debt holders would therefore be expected to impose market discipline on the bank that is quite consistent with what bank supervisors are trying to do…" (1998)*

One means of establishing more effective market discipline would be to introduce a mandatory sub-debt component as part of the bank capital requirement. The basic contention is that mandating sub-debt issuance would force the bank to continually "past the test of the market" and would provide signals to market participants of the condition of the bank. A sub-debt requirement could serve to produce both *direct* market discipline by increasing funding costs, and *indirect* discipline by having bank supervisors respond to the signal from sub-debt spreads.[1] This has led to a number of reform proposals to formally introduce *mandatory* sub-debt requirements for LCBOs, since it is these institutions that are typically associated with systemic concerns by regulators [Benink and Schmidt (2000), Calomiris (1997, 1998), Evanoff and Wall (2000a, b) and U.S. Shadow

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[1] To avoid the increased funding costs and adverse market signal, banks would operate in their own self-interest and would prudently manage their risk. There are a number of potential benefits associated with sub-debt proposals -- for a background discussion of sub-debt proposals and the potential advantages of such programs see Kwast, et al. (1999) and Evanoff and Wall (2000a,b).

Regulatory Committee (2000)].

For these proposals to have merit, holders of bank-issued sub-debt would need to effectively price the riskiness of the bank into the required yields in a manner consistent with financial theory. This has been the focus of a number of recent studies, which evaluate the relationship between sub-debt spreads and the risk characteristics of the issuing bank to determine whether debt holders demand a higher yield commensurate with the risk profile of banks.

However, it is important to point out that previous studies that have evaluated the potential usefulness of sub-debt yields for regulatory and supervisory purposes may be understating the true potential for these programs. This occurs because the environment in which yields have been evaluated will most likely be very different from the environment characterized by a fully implemented, mandatory sub-debt program. A formal sub-debt program can be expected to induce a number of adjustments in financial markets. Specifically, debt markets will probably become deeper, issuance will most likely be more frequent, debt will be viewed as a more viable means to raise regulatory capital, more attention will be paid to individual bank debt yields, bond dealers will be encouraged by pressure from both the banks and the public to be less reluctant to publicly disclose actual debt transaction prices, and generally, markets will be more closely followed.

This difference between the current and potential future market is partially a result of the well know Lucas Critique in which firms respond to regulatory change and optimize within the new regulatory framework; with constraints that may be very different than those that existed before the change. As a result, pre- and post-regulation firm and market behavior may change significantly once a sub-debt program is implemented. The market will most likely become more complete, making the resulting market signals more

informative. Sub-debt spread will become a more useful/meaningful signal for bank

supervision as well.[2]

Unlike in previous studies, whose findings are based on the current environment

(pre-mandatory sub-debt program), we attempt to take into consideration potential

changes in the market environment (brought about by a mandatory sub-debt program) to

improve estimates of the potential extent of market discipline. To do this, we focus on the

performance of sub-debt markets for LCBOs around new debt issues. Specifically, we

examine whether the market is "deeper," more transparent, and informative around initial

placements, and whether the risk pricing behavior surrounding the initial placements is

significantly different from the pricing of the same sub-debt issue in the secondary

market. Our contention is that after the sub-debt proposal has been fully implemented,

the characteristics of sub-debt markets will be somewhat similar (i.e., more closely

approximate) to what we find in today's markets around initial debt issues -- deeper, more

transparent, and more informative. Therefore, previous studies basing their analysis on

month-end or quarter-end prices in the secondary market are likely to underestimate the

potential impact of the sub-debt proposals.[3]

Related Literature:

Most of the literature suggests that the market accounts for risk when pricing sub-

debt of banking organizations.[4] There are a few exceptions. However, during those

periods when sub-debt premia was not found to be related to risk measures, there is

evidence indicating that debt-holders were not at risk in spite of the riskiness of the

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[2] Arguments consistent with this can be found in Morgan (2000a, 2000b), and Hancock and Kwast (2000).

[3] Actually, in the new environment debt markets will probably be still deeper and more fluid than that seen around new issues in today's markets. Thus, our estimates should be considered lower bound measures for potential increases in market discipline following the introduction of a mandatory sub-debt policy.

issuing bank -- partially due to the government's conjectural guarantee. The guarantee

was decreased in the U.S. via policy and legislative changes in the early 1990s, and

debtholders (the markets) apparently responded by more accurately pricing risk, as

debtholders no longer perceived themselves to be protected from losses. More recent

research finds that bank managerial decisions appear to be influenced by the market's

pricing of debt.[5]

For example, using secondary market prices and yields Flannery and Sorescu

(1996) examined sub-debt issued by bank holding companies (BHCs) during the 1983 to

1991 period. They found evidence of risk being priced in the more recent sub-period

1989-1991 when debt holders were subject to losses, but not during the earlier sub-

periods 1983-1985 and 1986-1988. They argue that for the earlier sub-periods, there was

a general perception that certain banks were too-big-to-fail. That is, there was a

conjectural guarantee for *all* liability holders at LCBOs during this earlier period. Thus,

yields were not risk sensitive because debt-holders did not perceive themselves to be at

risk.

Jagtiani, Kaufman, and Lemieux (2000) added to the literature by extending the

analysis into the 1992 to 1997 period (post-FDICIA) when too-big-to-fail policies had

been addressed by legislation and were thought to be less prevalent.[6] Additionally, they

separately evaluated publicly traded sub-debt issued by *BHCs* and sub-debt issued

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[4] For a more thorough literature review see Evanoff and Wall (2000b).

[5] For example, see Corvitz, Hancock and Kwast (2000), Billet, Garfinkel, and O'Neal (1998). The exception
to this finding is Bliss and Flannery (2001). However, as discussed below, they concentrate more on
behavioral changes after the debt markets have responded whereas most proponents of sub-debt proposals
emphasize the *ex ante* discipline (see Evanoff and Wall (2000b).

[6] FDICIA supposedly addressed the too-big-to-fail issue by requiring prompt corrective action by regulators
and least cost resolution provisions. Thus, it is argued, liability holders should now behave as if they were
subject to losses. There are still some who believe, however, that a perceived too-big-to-fail policy may still
be in effect [see Kane (2000), and Penas and Unal (2000)].

directly by *banks*. Analysis of bank-issued sub-debt is important because most of the reform proposals recommend the debt be issued at the bank level instead of the BHC level [e.g., Shadow Regulatory Committee (2000), Evanoff and Wall (2000a, b)]. They found that the market priced risks for both types of sub-debt about equally although BHC-issued sub-debt yielded a higher risk premium. This could reflect the lower priority on the BHC's assets in case of insolvency and/or, as argued by others, it could be a result of the safety net being directed at the bank. The important finding is that under a number of alternative specifications the market did appear to impose risk premia on sub-debt issued at the *bank* level.

Jagtiani and Lemieux (2001) extended the analysis to examine sub-debt spreads of failed banks during the period prior to failure and found evidence of strong market discipline. BHC-issued sub-debt spreads significantly rose as early as six quarters prior to the failure of the bank subsidiary. They concluded that sub-debt spreads could potentially be a useful signal in the supervisory process.

Morgan and Stiroh (2000a) analyzed whether or not the market was "tough enough" in pricing bank risk. They evaluated primary issues and tested whether debt spreads reflected the risk of a bank's portfolio. They also performed a similar analysis for non-banks to evaluate whether the risk-spread relationship differs between the bank and non-bank sectors. In addition, they evaluated whether the market adequately disciplined larger banks. Their concern was that too-big-to-fail policies may result in the market being "too easy" on larger institutions like the LCBOs. They found that the market did price risk exposure at banks -- that is, as banks shift their portfolio into riskier activities, they are forced to pay greater spreads to investors. The risk-spread relationship was nearly identical across the bank and non-bank sectors. However they found that the risk-

spread relationship was weaker for larger banks. They interpret this as evidence that larger banks still benefit from implicit guarantees, although there may be alternative interpretations.

Covitz, Hancock, and Kwast (2000) modeled and empirically estimated the bond issuance decision of banking organizations, and found evidence consistent with the market exerting discipline on the debt *issuance decision*. That is, riskier banks have a higher probability of not issuing new debt: a finding consistent with *ex ante* discipline by debt markets and stressing the need for a mandatory program instead of a volunteer one. They also found the market to be less vigilant during more tranquil periods. They conclude that market discipline could be enhanced by a mandatory sub-debt requirement and supervisors could benefit from monitoring sub-debt spreads.

Finally, Bliss and Flannery (2001) stress that while previous studies found evidence of the ability of the market to *evaluate* the riskiness of banks (that is, to effectively monitor firm behavior) they questioned whether the debt markets were able to *influence* the behavior of bank managers. While they found sub-debt spreads were associated with the riskiness of the bank, they did not find evidence consistent with managerial influence. That is, management was not found to respond with portfolio shifts in an attempt to decrease the risk of the bank after debt holders informed them that they had become concerned with their risk profile via larger debt spreads.7 Thus, they questioned whether discipline was being imposed if no signs of influence were found.

While much has been learned about the U.S. sub-debt markets in recent years,8

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7 Again, see Evanoff and Wall (2000b) for a critique of the policy conclusions of Bliss and Flannery.
8 There has also been research evaluating the potential for market discipline from sub-debt and other market instruments in non-U.S. markets. See Sironi (2001, 2003),

there are a number of uncertainties concerning how effective a mandatory program might be. One unknown results from the well-known Lucas critique. Lucas argued that the behavior of the regulated firm would most likely change in response to a policy change. For our purposes, pricing behavior in the sub-debt market will likely change as the market becomes much more active following the implementation of a mandatory program. Thus, empirical analysis of sub-debt pricing in the pre-policy period may be significantly different, and yield little relevant information concerning the potential effectiveness of the new policy. In evaluating the potential for a mandatory sub-debt proposal, previous research has typically concentrated on the risk–yield relationship in secondary markets [Morgan and Stiroh (2000a, 2000b) being the exception]. Once implemented, however, a mandatory issuance policy could affect the depth and effectiveness of the sub-debt market. We attempt to incorporate this expected increase in the depth, transparency, and effectiveness of the sub-debt market in our examination of the potential impact of the sub-debt program -- for example, by contrasting the risk-spread relationship around new debt issues. We also account for other factors, which may have biased the results found in previous studies.

3. The Potential Increasing Role of Market Information in Bank Supervision

Market information may be useful in the supervisory process because financial markets tend to respond quickly to publicly available information, thus incorporating information into the prices. This is not to imply that the market knows about the condition of banks than does bank supervisors, who have access to extensive private information through their on-site examination process (which occur every 12-18 months for most

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Hamalainen, Howcroft and Hall (2004) and Baumann, and Nier (2001).

banks). However, markets signals could potential play an important role in complementing the on-site examinations and could serve an even larger role through off-site monitoring between exams.

Previous studies have examined the usefulness of market information for the supervisory process-- including equity prices, returns, and volatility, sub-debt spreads and changes in spreads, EDF estimated default probability, and other related market variables [see Seale and Bloecher (2001), Curry, Elmer and Fissel (2001), Krainer and Lopez (2001), Berger, Davies and Flannery (2000), and Gunther, Levonian and Moore (2002)]. While it is not always the case, the results overall suggest that market information could be used to improve the predictive accuracy of traditional off-site monitoring models in predicting changes in the CAMEL ratings assigned by regulators.

The potential usefulness of this information has not gone unnoticed by regulators---according to the Federal Reserve Governor Laurence H. Meyer (1998):

> *"There is now general agreement that the markets are increasingly complex – making it more difficult for supervisors and regulators – and that supervision and regulation have significant costs and inefficiencies. As a result, we must begin to increase our reliance on market discipline both as a governor and as an indicator." (1998)*

> *"Observed risk premiums on sub-debt could perhaps be used to help the FDIC set more accurate risk-based deposit insurance premiums…. An additional benefit of having sub-debt traded on the open market, at least if the market for sub-debt was sufficiently liquid, is that price movements would provide a clear signal to the market evaluation of the bank's financial condition that would serve as an early warning signal to aid supervisors." (1998)*

Similarly, regulatory agencies have undertaken significant study of the informational content of market signals and have encouraged their use in the supervision process; see Stern

(2003).

While the potential usefulness of sub-debt spreads in the examination and monitoring process may be significant, critiques argue that there are potential operational issues, and therefore potential problems associated with using sub-debt spreads in practice. Covitz, Hancock, and Kwast (2000) find that monitoring of sub-debt markets by bank supervisors could provide useful information although supervisory actions should not be tied directly to sub-debt spreads. This is due to concerns about the quality of the signal and with the consistency of data on sub-debt spreads across banks. It is currently difficult to analyze and compare sub-debt spreads across banks in a time-series analysis because of difficulties involved in finding homogeneous sub-debt issues in the market. In addition to differing in characteristics (features, options, maturities, etc.), a meaningful comparison of sub-debt spreads across banks may also be difficult because of thin trading of some issues. Bianchi, Hancock, and Kawano (2003) suggest that illiquid bonds with less frequent trading activities are priced relatively poorly, and that the uncertainty about an illiquid bond's price rises under volatile market conditions.

Previous studies of corporate bond markets have attempted to investigate the components that constitute corporate bond yield spreads, but much is left unexplained. Huang and Huang (2002) find that less than 25 percent of the credit risk spread is explained by credit risk – with a larger percentage explained for junk bonds and a smaller percentage for short-term bonds. Generally, the time-series variation in credit spreads is primarily determined by bond market factors while the cross-sectional variation is mostly explained by the leverage ratio, equity volatility, issue size, and bond

age [see Collin-Dufresne, Goldstein and Martin (2001) and King and Khang (2002)].[9] Interestingly, behavior of the credit spreads (which have already accounted for time to maturity along the yield curve) differ at short maturities from that of long maturities [see Jarrow, Turnbull and Yu (2001)]. Additionally, Yu (2003) finds that the quality of disclosure about the issuing firm's financial information also has a significant impact on the behavior of spreads. That is, firms with higher disclosure quality tend to have lower credit spreads.

In this study, we examine the important determinants of sub-debt spreads. Our intent is to develop calculated premiums (or discounts) that may be used as adjustments to the observed sub-debt spreads to arrive at more meaningful and comparable spreads across various dimensions (e.g., liquidity, maturity, economic conditions, etc.). To account for illiquidity, transparency, and disclosure quality, we again focus on sub-debt spreads around the period of new debt issues when the market tends to be deeper and more transparent as issuers tend to be more forthcoming in disclosing information. Thus, we examine difference in the pricing behavior of sub-debt during the new issue period relative to other periods. The impact of time to maturity is also accounted for along with additional control variables.

4. The Empirical Model

We estimate the bank and BHC sub-debt yield spreads over the maturity-matched U.S. Treasury as a function of economic conditions and risk characteristics of the issuing bank. We account for potential differences in the risk-spread relationship during periods

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9 While leverage ratio and equity volatility play an important role in structural credit risk models, the issue size and bond age variables are thought to proxy for a liquidity

when new debt issuance occurs. Our prior is that banks may be less opaque around the time they approach the market for new debt placements. This occurs as a result of the initial placement process in which banks realize that the issue will be rated by credit rating agencies and their financial condition will receive more scrutiny than it typically would on a continual, on-going basis. Thus, banks are likely to be more forthcoming and more willing to provide the market with additional information in order to convince it to accept their new debt issue and to accurately price/rate it [see Covitz and Harrison (2004)]. This is not to imply that the banks attempt to hide information at other times, rather that they simply have a process for new debt issues which generates more information for the markets. Unless some newsworthy event occurs, less information will typically be provided on an on-going basis to the secondary market.

Fundamentally, we expect the sub-debt market to be deeper and more informative around new debt issues. This should result in a tighter spread-risk relationship due to increased information flows. We test this by analyzing the relationship between spreads and their determinants, allowing for the spread-risk relationship to vary around the time of new placements. We expect the period around new debt placements to more closely characterize the environment that would exist with a mandatory sub-debt program. To allow for the possible distinction between prices generated by the new placement process and prices generated as a result of the informational release around new placements, we also distinguish between prices from new debt placements and those from the secondary market. We expect prices in the primary and secondary market to be essentially the same, but allow for the possibility of peculiarities in the data with this binary.

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component.

In addition to accounting for additional market information around original placements, we also account for potential sample selection bias. Standard OLS estimation of the spread-risk relationship implicitly assumes that debt issuance decisions are random events. Our priors are that issuance is not random and that riskier institutions are generally less willing to go to the market with new debt issues. Covitz, Hancock, and Kwast (2000) and Covitz and Harrison (2004) find evidence consistent with this view. If this is the case, analysis of sub-debt spreads not accounting for this are subject to sample selection bias, since riskier institutions that do not issue sub-debt are excluded from the analysis. Thus, some previous studies may have underestimated the extent of the spread-risk relationship -- i.e., the extent to which the market may influence bank risk-taking behavior. This additional "disciplining influence" would be more fully realized under a mandatory sub-debt proposal.

We account for this sample selection bias, using a two-stage estimation process developed by Heckman (1979) and Greene (1981). Heckman proposes that a bivariate normal model be used to estimate the bank's decision to issue sub-debt. Then, once accounted for, an ordinary least squares (OLS) model can be used to estimate the spread-risk relationship for the selected sample. Therefore, we first model the issuance decision explicitly, and generate an observation-specific probability of issuance (actually an inverse Mills Ratio), which can be included in the spread equation to generate unbiased and consistent estimates of the spread-risk relationship. We also follow Green (1981) in computing the correct and consistent standard errors with the OLS estimates. Finally, besides correcting for the depth and transparency of the sub-debt market and for the sample selection bias, we analyze a relatively long relative to many previous studies--- 14 years from 1987 to 2000.

4.1 Sub-Debt Issuance Decision

To address potential sample selection bias, we account for the possibility that the issuance decision is not random by estimating the model described by Greene (1993, p. 713) and Maddala (1983, p. 260). We first model the debt issuance decision explicitly so that there exists an unobservable factor, D^*, which drives the issuance decision. We model D^* as a function of a vector of variables, W. The bank issues debt if $D^* > 0$, thus $D = 1$ if $D^*>0$, and $D=0$ otherwise; and $D^* = \gamma W + \mu$, where e and μ have bivariate normal distribution with means zero and the covariance matrix: $\begin{bmatrix} 1 & \rho\sigma \\ \rho\sigma & \sigma^2 \end{bmatrix}$

Given the issuance specification, one can show that: $E[e \mid D = 1] = \rho\sigma\, \varphi(\gamma W) / \Phi(\gamma W)$ and $E[e \mid D = 0] = -\rho\sigma\, \varphi(\gamma W) / (1-\Phi)(\gamma W)$, where $\varphi(\cdot)$ and $\Phi(\cdot)$ are the probability density function and the cumulative distribution function, respectively, of the standard normal distribution.[10] The above equations can be combined to generate the expression:

$$E[e \mid D] \quad = \quad \rho\sigma\ \frac{\varphi(\gamma W)\ \{D - \Phi F(\gamma W)\}}{\Phi(\gamma W)\ \{1 - \Phi(\gamma W)\}} \qquad = \quad \lambda(D, W; \gamma) \quad .$$

Therefore, to generate consistent estimates, we first estimate the issuance decision with a probit model and calculate a value for $\lambda(D, W; \gamma)$ for each observation using the estimate for γ. In modeling the debt issuance decision, we assume that issuance is related to current market conditions, regulatory capital needs, and bank-specific characteristics. This relationship is presented in equation (1) below where the

dependent variable is a binary variable that is equal to one if the banking organization i

issues a sub-debt in the current quarter t.

$$D\_ISSUE_{i,t} = \beta_0 + \alpha_1(UNEMP_t) + \alpha_2(GDP_t) + \alpha_3(TBILL\_3M_t) +$$
$$\alpha_4(D\_EXPAND_t) + \alpha_5(ASSETS_{i,t}) + \alpha_6(MKTLEV_{i,t}) + \alpha_7(NPLOAN_{i,t}) \qquad (1)$$
$$+ \alpha_8(OREO_{i,t}) + \alpha_9(ROA_{i,t}) + \alpha_{10}(CAPNEED_{i,t}) + \alpha_{11}(PE\_CAPNEED_{i,t}) + v_{i,t}$$

General economic and financial market conditions are expected to influence the

bank's issuance decision and are captured in our analysis with an array of financial

variables. $UNEMP_t$ is the seasonally adjusted national unemployment rate obtained from

the Bureau of Labor Statistics Data. GDP_t is seasonally adjusted real gross domestic

product (in $ billion 1996 base) provided by the U.S. Department of Commerce, Bureau

of Economic Analysis, and $TBILL\_3M_t$ is the 3-month Treasury bill (secondary market)

rate. We also include a binary variable to indicate the current economic condition

(D_EXPAND), which is equal to one if it is an expansionary period and zero otherwise.

This variable is obtained from the business cycle reference measure provided by the

National Bureau of Economic Research (NBER).

Bank-specific characteristics are also likely to influence the bank's issuance

decision. We therefore include various risk factors and control variables in the analysis –

log of asset size (*ASSETS*), a market measure of the leverage ratio (*MKTLEV*), the

bank's dependence on insured deposits as a funding source (*INSURED*), non-

performance loans (*NPLOAN*), other real estates owned (*OREO*), returns on assets

(*ROA*), a measure of the bank's need for additional funding or capitalization (*CAPNEED*)

and an interactive term of price-earnings ratio for the bank's equity and whether the bank

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[10] See Greene (1993) or Maddala (1983).

needs additional funding (*PE_CAPNEED*).

MKTLEV is included as a proxy of the banking organization's default risk as perceived by the market, since it captures the shift in market price of the bank's common stock relative to the movement of the bank's balance sheet information.[11] It is defined as the ratio of total liabilities (book value) to the combined value of common stock (market value) and preferred stock (book value). The variable *CAPNEED* is a dummy variable that is designed to control for the bank's need for additional capital. It is equal to one if the capital rating (C component of the CAMEL) is unsatisfactory (3, 4, or 5) and zero otherwise. Banks with a 3-rated C component or worse are likely to be required to raise their capital ratios by issuing equity or sub-debt. The price-earnings ratio (*PE*) is also included as an interactive term with *CAPNEED*. An undercapitalized bank's decision of whether to issue new sub-debt or equity to meet its funding need is likely affected by the relative market price (over-valued or under-valued) of their shares when additional capital is needed. The PE ratio is used to proxy for the over- or undervaluation of the stock. The interactive measure (*PE_CAPNEED)* is expected to have a negative coefficient if undercapitalized banks tend to issue equity rather than sub-debt if their equities are over-priced as reflected in the relatively high price-earnings ratio.[12]

The calculated λ value from equation (1) above produces an observation specific "Inverse Mills Ratio." If $\hat{\lambda} = \lambda\ (D,\ W; \hat{\gamma}\ )$ represents this estimate, then consistent

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[11] This definition of leverage takes into account the market value of the bank rather than relying purely on book-value accounting information. This definition has been used in Jagtiani, Kaufman, and Lemieux (2002), Jagtiani and Lemieux (2001), Flannery and Sorescu (1996), and Hancock and Kwast (2001). This measure tends to be positively related to the bank's sub-debt spreads, reflecting greater risk at banks with higher market leverage ratio.

[12] If the equity is thought to be over valued by the firm, it will likely be management's instrument of choice to raise new capital. However, the PE ratio may be a very imprecise measure of the relative value of the stock. Additionally, sub-debt issuance for regulatory capital purposes is limited by regulators (see Evanoff and Wall (2000a), which may also bring into question the potential of this measure in determining the

parameter estimates for the sub-debt spread equation can be obtained by incorporating this information into equations (2) and (2)' using OLS regression procedures.

4.2 Risk-Spread Relationship

The next step is to specify a model that describes the bank's sub-debt spread. The risk-spread relationship using data for bank i at time t is written in equations (2) and (2)'. Spreads are expected to be related to macroeconomic conditions, risk characteristics of the issuing banks, and other general characteristics of the sub-debt issues. In addition to the various risk characteristics included in the decision to issue new sub-debt equation (1), we also include another risk variable *INSURED,* which is the degree of reliance on insured deposits as measured by the ratio of insured deposits to total liabilities.[13] Previous studies find that riskier banks tend to rely more on insured deposits as a subsidized funding source. That is, banks tend to shift their funding source towards insured deposits as their financial condition deteriorates. Moreover, we examine the impact of the bond's term to maturity (*MATURITY*) in equation (2) to account for potential differences in spreads over the life of the bond; a somewhat common finding in the finance and investment literature. We measure term to maturity by the number of quarters until maturity date. We also employ an alternative measure of *MATURITY* – using binary variables to trifurcate the data into three maturity categories (less than 1 year, 1-3 years, and longer than 3 years to maturity). The variable *D_BANK* is equal to 1 if the observed spreads are associated with sub-debt issued by the bank, and zero if the sub-debt was issued at the bank holding company (BHC) level. Sub-debt spreads are

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instrument of choice.
[13] Billett, Garfinkel, and O'Neal (1998) found that banks are likely to rely more on insured deposits as they

expected to be somewhat narrower when issued at the bank level due to either the bank being a less risky entity that the parent organization or the FDIC federal guarantee provided to the bank. The variable *D_PRIMARY* is equal to 1 if the spreads are observed from the primary market (new sub-debt issues), and zero for secondary market spreads.

As an alternative specification, some 'substitute' measures of risk are also used in equation (2)' to check for the robustness of the results. The 'substitute' measures include the supervisory ratings assigned by bank regulators (*CAMEL* for banks and *BOPEC* for BHCs) and the credit ratings assigned by Standard & Poor's (*SPRATE*).

$$
\begin{aligned}
SPREAD_{i,t} = {} & \alpha_0 + \beta_1(UNEMP_t) + \beta_2(GDP_t) + \beta_3(TBILL\_3M_t) + \\
& \beta_4(D\_EXPAND) + \beta_5(ASSETS_{i,t}) + \beta_6(MATURITY_{i,t}) + \\
& (\beta_7 + \delta_7 D_t)(MKTLEV_{i,t}) + (\beta_8 + \delta_8 D_t)(INSURED_{i,t}) + \\
& (\beta_9 + \delta_9 D_t)(NPLOAN_{i,t}) + (\beta_{10} + \delta_{10} D_t)(OREO_{i,t}) + \\
& (\beta_{11} + \delta_{11} D_t)(ROA_{i,t}) + \beta_{12}(D\_BANK) + \beta_{13}(D\_PRIMARY) + \\
& \beta_{14}\lambda + \mu_{i,t}
\end{aligned}
\tag{2}
$$

$$
\begin{aligned}
SPREAD_{i,t} = {} & \alpha_0 + \beta_1(UNEMP_t) + \beta_2(GDP_t) + \beta_3(TBILL\_3M_t) + \\
& \beta_4(D\_EXPAND) + \beta_5(ASSETS_{i,t}) + \beta_6(MATURITY_{i,t}) + \\
& (\beta_7 + \delta_7 D_t)(CAMEL_{i,t}) + (\beta_8 + \delta_8 D_t)(SPRATE_{i,t}) + \\
& \beta_9(D\_BANK) + \beta_{10}(D\_PRIMARY) + \beta_{11}\lambda + \mu_{i,t}
\end{aligned}
\tag{2'}
$$

We expect that there would be additional "disciplining influence" around the time of new debt placements, when the market will be "more aware" of the bank's financial conditions and the overall riskiness of the banks. To account for this increased depth and transparency around initial placements, we allow the risk-spread relationship to vary during these periods. We designate a dummy variable D_t to capture the initial placement period. It is equal to one for the period t in which new debt issues are made, and zero otherwise. This initial placement effect is incorporated into the model interactively with

become more risky. Jagtiani, Kaufman, and Lemieux (2000) found a significant relationship between

the various risk-characteristics, as reflected in equations (2) and (2)'

Finally, we incorporate the estimated issuance factor from the previous section equation (1) into the risk-spread models in equations (2) and (2)'. Note that the disturbance term μ is uncorrelated with D_t. The OLS estimate of β_{14} in equation (2) and β_{11} in equation (2)' give a consistent estimate of $\rho\sigma$.

5. Empirical Results

Concerning the empirical estimates, we hypothesize that there will be a closer (tighter) relationship between spread and risk measures around the time of new debt issues. Evidence of such a relationship would support proposals that require banks to regularly issue a certain amount of sub-debt to allow the market to impose discipline on banks' risk taking behavior, and to limit the federal safety net subsidy. Below we discuss the data sources and definitions and present the empirical results.

5.1 The Data

Our sample banks and BHCs are derived from the largest 100 U.S. commercial banks and their parent BHCs – see Appendix 1 for the list of our sample banks and BHCs. For these firms we collected detailed information on outstanding bonds from Bloomberg Data Services. We selected one representative subordinated bond for each bank and one representative subordinated bond for each BHC at any point of time. When a selected bond matured, it was replaced by a different bond. To be included in the sample, the selected debt securities had to meet the following criteria: 1) be publicly traded (in order to be able to trace historical prices and yields), 2) be in issues of at least

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INSURED and sub-debt spreads.

$100 million, 3) be U.S. dollar denominated and issued and traded in the U.S. capital

markets, 4) be rated by S&P and/or Moody's, and 5) be straight bonds with no callable,

putable, convertible, or other option features. The sample is restricted to option-free

bonds to obtain a more homogeneous group of bonds, and to avoid excessive noise

introduced by the models used for computing option adjusted spreads, which vary

substantially among market participants. The final sample includes subordinated bond

issues for 19 banks and 39 BHCs for the 1987 to 2000 period; capturing both the pre-

and post-FDICIA periods. The sampled banks and BHCs are listed in the Appendix. No

more than one bank subsidiary is included in the sample for each of the sampled BHCs.

We observed the primary (when issued) and secondary market prices of securities

outstanding at quarter-end over this period.[14] Issuers did not necessarily have bonds

outstanding in each year. Bond yields were computed from the observed prices of the

bonds, and information on the accounting risk characteristics of the issuing banks was

obtained from the Report of Condition and Income (Call Report) for banks and Federal

Reserve Y-9 and Y-9LP Reports for BHCs. Regulator's CAMEL and BOPEC ratings are

from confidential supervisory data and bond ratings are obtained from Bloomberg or

directly from S&P (if not reported by Bloomberg). Table 1 provides the variable

description summary.

5.2 Empirical findings

Table 2 presents the results from our Logistic analysis based on equation (1). The

dependent variable, *D_ISSUE*, is equal to 1 if the banking firm issues new publicly traded

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[14] Bloomberg reports BGN bond prices, which are a volume-weighted average of transaction prices in each
day. When securities are not traded in a day, quoted prices by a number of pricing providers are used. All

sub-debt in that quarter, and zero otherwise.   Results obtained using alternative measures of risk are included in columns 1, 2 and 3.

From column 1 of Table 2, controlling for the need for additional capital (*CAPNEED)* and the choice of the new capital instrument, whether new sub-debt or new equity *(PE*CAPNEED)*, we find that both economic variables and the bank's risk characteristics are significantly related to the bank's decision whether or not to issue sub-debt in that quarter. *(PE*CAPNEED)* is not significant in any of the specifications in Table 2, reinforcing our earlier concerns about this measure as an indicator for the pecking order of capital instruments. The results indicate that larger banking institutions are generally more likely to issue publicly traded sub-debt than are smaller banks. In addition, riskier banks with larger market leverage ratios (*MKTLEV*) and riskier loan portfolios, as measured by a larger share of other real estate loans (*OREO*), are less likely to issue new sub-debt. These results are consistent with Covitz, Hancock, and Kwast (2003), who examine sub-debt issues from an earlier time period (1996 and 1997) and find that riskier banks were less likely to issue sub-debt.

From column 2 of Table 2, using the alternative risk measures, we find that after controlling for capital need, less creditworthy banks (with larger converted numerical ratings) are less likely to issue new debt. Thus, banks tend to avoid issuing sub-debt when their financial condition deteriorates. This is consistent with Billett, Garfinkel, and O'Neal (1998) who find that riskier banks tend to avoid the discipline of the marketplace and rely more on insured deposits as a subsidized funding source. The overall results from the issuance model are consistent with the argument that market discipline in the

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bond prices reported by Bloomberg are a weighted average based on at least two price sources, and must be within a tight range.

U.S. banking industry could possibly be enhanced by requiring all large banks – both risky and safe banks – to periodically issue publicly traded sub-debt.

Table 3 presents the results from our estimation of sub-debt spreads based on equations (2) and (2)' incorporating Heckman's sample selection correction. Again, we control for the sample selection bias since the observed spreads are more likely to be those of less risky banks that have decided to issue sub-debt. We account for the potential for markets to be more informative around new issues by interacting binary variables with the risk measures; again expecting that markets would be better informed, more liquid and more transparent around new debt issuances.

The overall results in Table 3 suggest that both economic variables and the bank's risk characteristics are important determinants of sub-debt spreads. Spreads tend to be associated with the macro variables. They were are positively related to gross national product (*GDP*), level of short-term risk-free interest rate as measured by 3-month Treasury rate (*TBILL_3M*), and the overall recessionary risk as measured by the unemployment rate (*UNEMPLOY*). In addition, sub-debt spreads tend to be smaller during expansionary periods (*D_EXPAND*).

In terms of risk characteristics of the issuing banks, the market seems to demand smaller sub-debt spreads from larger banking institutions, possibly due to the perception that larger banks are more diversify and tend to be better managed. Some large and complex banking organizations (LCBOs) may also be perceived by the market to be too-big-to-fail, thus lowering the riskiness and the spreads accordingly. Other important risk characteristics are non-performing loans (*NPLOAN*) and profitability as measured by returns on assets (*ROA*). Banks with larger non-performing loans and lower profits had larger sub-debt spreads. Market leverage (*MKTLEV*) is also weakly positively significant

in some cases, suggesting that banks with higher market leverage ratios are more risky and are required by the market to pay a corresponding higher funding cost. The variable *INSURED*, which measures the degree a banking institution depend on insured deposit as a subsidized funding source, does not significantly add explanatory value above and beyond the set of risk variables described earlier (as shown in column 3 of Table 3). Since an inclusion of *INSURED* significantly reduces our number of sample observations--since insured deposits are reported less frequently than other variables--we do not include it in columns 4, 5, and 6.

From column 2 of Table 3, we use credit ratings as assigned by credit rating agencies (*S&P RATING*) and supervisory ratings assigned by bank regulators (*CAMEL*) as a substitute for the other risk variables. The credit ratings are significant with the expected signs as banks deemed to be riskier by these agencies are required by the market to pay larger sub-debt spreads. Again, this is consistent with the existence of market discipline in the sub-debt market.

In columns 4 and 5 of Table 3, we test our hypothesis about the market being more informative around new debt placements. The risk variables are included alone plus interactively with *D_ISSUE* to see whether the degree of market discipline became stronger during the new issuance periods. We find that these interactive terms are frequently significant as expected. The variable *Issue_NPLOAN* is significantly positive while the risk variable *NPLOAN* also remains significantly positive. In addition, the variable *Issue_OREO* is significant while the variable *OREO* remains insignificant as a stand alone variable. Similarly, from column 6 of Table 3, where the credit ratings are used as risk measures, the interactive variable *Issue_S&PRATE* is also significant. The results overall suggest that the risk-spread relationship is significantly stronger during the

new issuance periods than other periods. This is consistent with the contention that market discipline in the U.S. banking industry could be enhanced if banks were required to periodically issue sub-debt.

The variable *D_PRIMARY*, which indicates whether the observed sub-debt spreads are from the primary market or secondary market, is generally negative but not significant (except in column 3). This, in conjunction with the significance of interactive variables mentioned above, suggests that the increased liquidity and transparency due to the new issue (primary market of new sub-debt issue) does have a significant impact on outstanding sub-debt issued by the firm. That is, it does not appear to be a function of the peculiarities of the original placement, but rather the information flowing at the time of the new placement.

The variable *D_BANK*, which indicates whether the observed spreads are for sub-debt issued at the bank level or the BHC level, is generally negative, but insignificant. Spreads are generally expected to be smaller for bank issues than for BHC issues, because of the safer nature of bank operations and/or because of the FDIC subsidy value. The sample period being entirely after the FDICIA may partially be the cause of this insignificance. Finally, the variable *LAMDA* generated in the issuance equation is generally negative but generally not significant. This suggests that spreads tend to be smaller for banks that are more likely to issue (i.e., less risky banks).

In addition to examining the impact of increased transparency and liquidity during new issuance, we are also interested in the impact of other characteristics such as time to maturity. While sub-debt signals may provide useful information to bank supervisors, the difficulty in finding sub-debt issues with the same remaining maturity across banking institutions makes it somewhat difficult for bank supervisors to analyze and compare sub-

debt spreads across banks.[15]   We estimate premiums to be adjusted to the observed

sub-debt spreads for the purpose of comparison across banking institutions. From

columns 3 and 5 of Table 3, spreads are positively related to the time to maturity of sub-

debt (*TTM*) as measured by the number of the remaining quarters to maturity. This is

after controlling for the yield curve when calculating sub-debt spreads used as the

dependent variable. The coefficient of TTM is 0.0002 in both columns 3 and 5

suggesting that an average of 2 basis points per remaining quarter could be added to the

observed sub-debt spreads when comparing sub-debt with varying remaining maturities.

Alternatively, we use a different measure of time to maturity in columns 1, 2, 4,

and 6, where the remaining maturities are divided into three 'buckets' – less than a year,

1 to 3 years, and longer than 3 years. The results suggest that a premium of 16 to 27

basis points could be added to the observed spreads for those sub-debt issues with a

remaining maturity of 1 to 3 years. Similarly, the premium of 23 to 35 basis points could

be adjusted for sub-debt with remaining maturity longer than 3 years.

6. Conclusions and Policy Implications

There have recently been a number of proposals to increase the role of

subordinated debt in the bank capital requirement in an attempt to increase the role of

market discipline on large and complex banking organizations (LCBOs). There has also

been a growing consensus that bank risk could be more effectively managed if market

information and market discipline were more fully incorporated into the supervisory

process. These two issues are inter-related. Effective market discipline will enhance the

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[15] This is why reform proposals typically stress the need for homogeneous, and often short term, debt
issues. See Evanoff and Wall (2000a).

quality of market signals which can be used by bank supervisors for on-site as well as off-site monitoring efforts to identify problem institutions. This should help regulators more efficiently allocate supervisory resources.

Previous studies have found that sub-debt markets do differentiate between banks with different risk profiles. However, these studies have evaluated the potential usefulness of sub-debt yields in an environment that most likely is very different from the one that will characterize a fully implemented sub-debt program. With the sub-debt program, the market will likely become deeper, issuance will be more frequent, debt will be viewed as a more viable means to raise capital, more attention will be paid to individual bank debt yields, bond dealers will be less reluctant to publicly disclose more details on debt transactions, and generally, the market will be more closely followed. This potential change is partially a result of the response of banks to the new regulatory environment. Firms will respond to the regulation and optimize within the new regulatory framework; with constraints that may be very different than those before the regulatory reform. The more complete market will probably make the signals available from these markets more informative.

In order to get an indication of the potential differences between the current and potential sub-debt markets, we evaluate the risk-spread relationship accounting for the enhanced market transparency surrounding new debt issues. We account for differences in debt maturity structure across banks and for potential sample selection bias; both which have often been overlooked in previous studies. Our empirical results indicate that a bank's risk profile is one of the factors in its decision to issue new debt. Banks tend to avoid issuing sub-debt during a period of financial deterioration. We find evidence consistent with market discipline in the sub-debt market, and with the degree of market

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discipline being stronger (tighter risk-spread relationship) during the period around new issuance. We attribute this to greater liquidity and transparency. Our overall results support the argument that the degree of market discipline in U.S. banking would likely be enhanced by requiring banks to maintain part of their regulatory capital requirement in the form sub-debt, and to be required to 'come-to-the-market' at regular intervals with new debt issues regardless of their current financial condition.

Our results also provide some important implications related to the use of sub-debt signals in the supervisory process. While the potential usefulness of sub-debt spreads in the examination and monitoring process may be significant, critiques argue that there are potential problems with using sub-debt spreads in practice. This is due to concerns about the quality of the sub-debt signal and the consistency of sub-debt data across banks. It is currently difficult to analyze and compare sub-debt spreads across banking institutions because of difficulties involved in finding homogeneous issues in the market. A meaningful comparison of sub-debt spreads across banks may also be difficult to achieve because of thin trading of some issues. In this study, we start the process of calculating specific premiums that could be used to adjust the observed sub-debt spreads for the various remaining maturities to arrive at more meaningful and more comparable spreads across banking institutions. It is hoped that by developing additional information on the impact of an important determinant of sub-debt spreads (i.e. time to maturity) will allow for more effective use of market information in the supervisory process.

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Table 1
Variable Description

Variable	Summary of Variable Description
SPREAD	Bond yield minus maturity matched U.S. Treasury yield (%)
ASSETS	Log of total assets
D_BANK	Dummy for bank-issued bonds (=1 for bank bonds, 0 for BHC bonds).
MATURITY	Time (number of quarters) to maturity of the bond
TTM_13, TTM_>3	TTM_13 equals to 1 if time to maturity is 1 to 3 years and TTM_>3 equals to 1 if time to maturity is greater than 3 years, zero otherwise.
INSURED	Total insured deposits divided by total assets (%)
MKTLEV	Total liabilities (book) divided by (market value of common stocks plus book Value of preferred stocks (%)
NPLOAN	The ratio of nonaccruing non-performing loans to total assets (%)
OREO	Other real estate owned to total assets (%)
ROA	The ratio of net income to total assets (%)
CAMEL	Weighted (time) average of the two CAMEL ratings assigned by regulators (around the relevant year-end date), where C=Capital, A=Asset quality, M=Management, E=Earnings, L=Liquidity.
SPRATE	Cardinalized S&P credit rating (following Jagtiani, Kaufman, Lemieux 2002), where less creditworthy banks (lower alphabetical rating) is converted to a larger numerical rating.
TBILL_3M	3-mo Treasury yield
GDP	Gross domestic product
UNEMP	National unemployment rate
CAPNEED	Dummy for capital need (=1 if C rating is 3, 4, or 5; =0 if C rating is 1 or 2)
D_t or D_{t-1}	Dummy indicating that the banking firm issues new publicly traded debt in that quarter (D_t =1) or in the previous quarter (D_{t-1}=1), respectively, and 0 otherwise
D_PRIMARY	Equal to 1 for primary market yield spreads, zero for secondary market yield spreads.
D_ISSUE	Binary dependent variable indicating whether the banking firm decides to issue sub-debt in that quarter (D_ISSUE=1) and equal to zero otherwise.

Table 2
Important Factors Determining Sub-Debt Issuance Decision
Using Logistic Regression Analysis (Data 1987-2000)

Dependent variable is *D_ISSUE*, a binary variable equal to 1 if the banking firm issues a new sub-debt in that quarter, and zero otherwise. P-values (Pr > ChiSq) are in parentheses. The ***, **, * represents the 1%, 5%, and 10% significance level, respectively.

	(1)	(2)	(3)
Intercept	-0.3320 (0.9754)	1.0968* (0.0592)	-1.5446 (0.8901)
UNEMPLOY	-0.8408 (0.1698)		-0.8149 (0.1857)
GDP	-0.0021** (0.0120)		-0.0021** (0.0141)
TBILL_3M	-0.2213 (0.3337)		-0.2142 (0.3507)
D_EXPAND	1.2960* (0.0533)		1.2720* (0.0587)
ASSETS	1.1240*** (0.0001)		1.1512*** (0.0001)
MKTLEV	-0.0002*** (0.0032)		-0.0002*** (0.0038)
NPLOAN	0.1339 (0.5064)		0.1245 (0.5588)
OREO	-1.7033*** (0.0010)		-1.7477*** (0.0015)
ROA	0.3555 (0.1444)		0.3560 (0.1466)
CAPNEED	1.2795** (0.0437)	1.3882*** (0.0073)	1.2857** (0.0436)
*PE*CAPNEED*	0.3202 (0.4243)	0.0944 (0.8068)	0.3202 (0.4230)
CAMEL		0.2122 (0.2888)	-0.0561 (0.8209)
S&P RATING		-0.7196*** (0.0016)	0.1247 (0.6754)
% Concordant	74.6	53.9	74.6
% Discordant	25.2	38.1	25.2
% Tied	0.2	8.0	0.3
-2 Log Likelihood	676.6	761.5	676.4

Table 3
Important Factors Determining Sub-Debt Spreads (Data 1987-2000)
Using Heckman Two-Step Selection Correction Estimation

Dependent is sub-debt spread (*SPREAD*). P-values (Pr > ChiSq) are in parentheses. The ***, **, * represents the 1%, 5%, and 10% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.0028 (0.9360)	-0.0870** (0.0137)	0.0049 (0.8804)	0.0113 (0.7569)	0.0236 (0.5044)	-0.0858** (0.0145)
UNEMPLOY	0.0023 (0.2733)	0.0059*** (0.0033)	0.0014 (0.4166)	0.0022 (0.3181)	0.0017 (0.4539)	0.0058*** (0.0036)
GDP	0.0001 (0.1013)	0.0001** (0.0112)	0.0001* (0.0695)	0.0001* (0.0946)	0.0001 (0.1494)	0.0001** (0.0108)
TBILL_3M	0.0015** (0.0348)	0.0026*** (0.0003)	0.0008 (0.1808)	0.0014* (0.0664)	0.0011 (0.1404)	0.0026*** (0.0004)
D_EXPAND	-0.0132*** (0.0001)	-0.0163*** (0.0001)	-0.0015 (0.6853)	-0.0133*** (0.0001)	-0.0132*** (0.0001)	-0.0163*** (0.0001)
ASSETS	-0.0024 (0.1044)	-0.0002 (0.8312)	-0.0026** (0.0144)	-0.0030* (0.0593)	-0.0031* (0.0504)	-0.0002 (0.8343)
MKTLEV	0.0001 (0.5874)		0.0001* (0.0569)	0.0001 (0.3366)	0.0001 (0.3104)	
NPLOAN	0.0036*** (0.0001)		0.0045*** (0.0001)	0.0025*** (0.0009)	0.0025** (0.0147)	
OREO	-0.0005 (0.7725)		-0.0015 (0.3508)	0.0032 (0.1968)	0.0032 (0.1957)	
ROA	-0.0024*** (0.0001)		-0.0018** (0.0112)	-0.0019* (0.0646)	-0.0018** (0.0153)	
INSURED			-0.0001 (0.4979)			
Issue_MKTLEV				-0.0001 (0.3953)	-0.0001 (0.4685)	
Issue_NPLOAN				0.0021*** (0.0064)	0.0021*** (0.0080)	
Issue_OREO				-0.0058** (0.0100)	-0.0056** (0.0121)	
Issue_ROA				-0.0007 (0.3813)	-0.0007 (0.3998)	

Table 3 (Continued)

	(1)	(2)	(3)	(4)	(5)	(6)
CAMEL		0.0019** (0.0122)				0.0007 (0.5319)
S&P RATINNG		0.0031*** (0.0002)				0.0038*** (0.0001)
Issue_CAMEL						0.0019 (0.1058)
Issue_S&PRATE						-0.0013* (0.0561)
TTM (# Quarters)			0.0002* (0.0609)		0.0002** (0.0155)	
TTM (1-3 Yrs)	0.0017** (0.0279)	0.0027*** (0.0007)		0.0016** (0.0373)		0.0027*** (0.0006)
TTM (>3 Yrs)	0.0025** (0.0237)	0.0035*** (0.0017)		0.0023** (0.0318)		0.0032*** (0.0039)
D_BANK	-0.0008 (0.3343)	-0.0002 (0.8467)	0.0005 (0.5223)	-0.0007 (0.3298)	-0.0007 (0.3324)	-0.0003 (0.6820)
D_PRIMARY	-0.0002 (0.8449)	-0.0001 (0.9353)	-0.0029* (0.0549)	-0.0002 (0.8526)	-0.0006 (0.5842)	-0.0003 (0.8008)
LAMDA	-0.0029 (0.3345)	-0.0029* (0.0985)	-0.0029 (0.1145)	-0.0041 (0.1907)	-0.0042 (0.1886)	-0.0029 (0.1054)
Adj R-Square N	64.7% 618	60.3% 618	65.7% 433	65.6% 618	65.7% 618	60.7% 618

Appendix 1
List of Sampled Banks and BHCs (Assets as of Yearend 1997)

Banks	Assets ($ millions)	BHCs	Assets ($ millions)
Chase Manhattan Bank	297,061	Chase Manhattan Corporation	365,521
		Citicorp	310,897
Morgan Guaranty Trust Co of NY	196,794	J.P. Morgan & Co. Incorporated	262,159
Bnk of America Natl Trust & Savings	236,982	Bankamerica Corporation	260,159
		Nationsbank Corporation	264,562
First Union National Bank	124,995	First Union Corporation	157,274
		Bankers Trust New York Corp	140,102
The First Natl Bank of Chicago (95-97)	58,483	First Chicago NBD Corporation	114,096
		Banc One Corporation	116,182
Wells Fargo Bank, N.A.	89,156	Wells Fargo and Company	97,456
		Norwest Corporation	88,540
Fleet National Bank	63,884	Fleet Financial Group, Inc.	85,690
Keybank National Association	69,708	KeyCorp	73,624
PNC Bank, National Association	69,710	PNC Bank Corp.	75,101
U.S. Bank National Association	67,597	U.S. Bancorp	71,295
BankBoston, National Association	64,954	BankBoston Corporation	69,268
		Bank of New York Company,Inc	59,961
		Republic New York Corporation	55,638
		Southtrust Corporation	57,981
National City Bank	16,540	National City Corporation	54,684
		Wachovia Corporation	65,397
Mellon Bank, National Association	38,802	Mellon Bank Corporation	44,947
Comerica Bank	28,936	Comerica Incorporated	36,453
Mercantile Bank Natl Association	15,706	Mercantile Bancorporation	30,020
		Suntrust Banks, Incorporated	30,906
Summit Bank	24,171	Summit Bancorp	30,016
		BB&T Corporation	29,178
The Northern Trust Company	23,894	Northern Trust Corporation	25,315
The Huntington National Bank	26,590	Huntington Bancshares Incorporated	26,731
		Crestar Financial Corporation	24,974
		Regions Financial Corporation	23,340
		Marshall & Ilsley Corp.	19,477
		Union Planters Corp.	18,105
		First Tennessee National Corp.	14,389
		Old Kent Financial Corporation	13,774
		Compass Bancshares, Inc.	13,511
Star Bank, National Association	10,672		
		Central Fidelity Banks, Inc.	10,556
		Zions Bancorporation	9,482
		Bancwest Corp.	8,093